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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Paul S. Weiss

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11/17/2004

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EXAMINER

NGUYEN, KHIEM D

ART UNIT

PAPER NUMBER

2823

DATE MAILED: 11/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/873,614

Applicant(s)

WEISS ET AL.

Examiner

Khiem D Nguyen

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 and 33-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 and 33-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

Claims 2-4 and 14 are objected to because of the following informalities:

Claims 2 and 3 recite the limitation "organic resist" in line 1. There is insufficient antecedent basis for this limitation in the claim.

Claims 4 and 14 recite the limitation "multilayer organic molecule resist" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-12, 14, 16-29, and 33-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marukawa et al. (U.S. Patent 5,627,090) in view of Shinji Matsui (IEEE Vol. 85, No. 4, April 1997).

In re claim 1, Marukawa discloses a method for manufacturing nanostructure patterns comprising (col. 7, line 61 to col. 10, line 4 and FIGS. 1-5): overlaying a parent structure 3 and 4 selectively deposited on a substrate 1 with an organic molecule 5 and 6 having a metal ion coordinating portion adsorbing on the parent structure in preference to the substrate to form an organic molecule layered parent structure; depositing a layer 7 over the at least one parent structure and in contact with at least a portion of the organic

molecule layer; and removing the organic molecule layer contacting the parent structure and the organic molecule layer to leave a residual structure 7a.

Marukawa does not explicitly disclose applying a metal ion solution to the organic molecule layered parent structure to attach the metal ion to the metal ion coordinating portion of the organic molecule and forming an organic molecule layer attached to the metal ion.

Matsui, however, discloses a method for manufacturing nanostructure patterns comprising (pages 630-632 and FIGS. 1-34): applying a metal ion solution (Au) to the organic molecule layered parent structure to attach the metal ion to the metal ion coordinating portion of the organic molecule (PMMA) and forming an organic molecule layer attached to the metal ion (pages 630-631). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Marukawa and Matsui to enable the process of attaching the metal ion to the metal ion coordinating portion of the organic molecule of Marukawa to be performed and furthermore to obtain high resolution, high overlay accuracy, and convenient for a nanodevice fabrication process (page 631, Matsui).

In re claims 2 and 3, **Matsui** discloses wherein the steps of removing the organic resist is chemical and electrochemical (pages 631-632).

In re claim 4, **Marukawa** discloses wherein the steps of removing the multilayer molecule resist removes a portion of the layer deposited (FIGS. 1-5). Additionally, Matsui also discloses wherein the steps of removing the multilayer organic molecule resist removes a portion of the layer deposited (page 631).

In re claims 5-8, Matsui discloses wherein the residual structure includes a line, a dot, or a ring (pages 631-632) and wherein the residual structure includes two or more adjacent lines (pages 631-632).

In re claim 9, Marukawa discloses wherein a first portion of the at least one parent structure (**FIG. 4: 3**) is a first material and a second portion (**FIG. 4: 4**) of the at least one parent structure is a second material (col. 8, lines 2-10).

In re claims 10-11, it is well-known to one of ordinary skill in the art of making semiconductor devices to image the nano residual structure with scanning probe microscopy because at lower target concentrations, the nano residual structure could not be visualized with the naked eye.

In re claim 12, Marukawa discloses wherein the substrate is a semiconductor substrate (col. 8, lines 16-22) and Matsui discloses wherein the substrate is silicon (**FIG. 25**).

In re claim 14, Marukawa discloses wherein the layers of the multilayer organic molecule resist are connected with ions (col. 8, lines 2-39).

In re claims 16, 17, 18, Marukawa discloses smoothing the at least one parent structure (col. 8, lines 8-13) and is accomplished chemically or electrochemically. Additionally, Matsui also discloses smoothing the at least one parent structure and is accomplished chemically or electrochemically (page 632).

In re claim 19, Marukawa discloses designing the at least one parent structure (**FIG. 5: 3, 4**) to result in the residual structure (**FIG. 5: 7a**) having a width less than a width of the at least one parent structure.

In re claim 20, whether the at least one parent structure to have a concave segment is inherently depends on the desired result one want to obtain.

In re claim 21, Marukawa discloses removing a portion of the residual structure (**FIG. 5**). Additionally, Matsui also discloses removing a portion of the residual structure (page 632).

In re claims 22 and 26-29, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to applied the techniques as taught by Marukawa in combination with Matsui in claim 1 to overlay the at least a portion of the residual structure with a second organic molecule and depositing a second layer over the residual structure and then removing the second organic molecule layer contacting the parent structure and the organic molecule layer to obtain a second residual structure. Marukawa does not restrict the structure to one layer of organic resist and residual structure. The practitioners may use multiple iterations to form her devices as necessary.

In re claims 23, 24, and 25, Matsui discloses smoothing the residual structure wherein smoothing is accomplished chemically or electrochemically (pages 631-632).

In re claim 33, Marukawa and Matsui discloses designing the at least one parent structure to result in the residual structure being spaced more closely than the at least one parent structure Marukawa (**FIG. 5**) and Matsui (pages 631-632).

In re claim 34, Matsui discloses that the method of claim 1 further comprising the step of repeating in sequence the steps of applying the metal ion solution and forming the organic molecule layer (page 631).

In re claim 35, Matsui discloses that the repetition step is repeated until up to 39 layers of the organic molecule layer are formed. The practitioners may repeat the step to obtain as many as organic molecule layer as he/she wishes.

In re claim 36, Marukawa discloses that the substrate is a silicon oxide (col. 8, lines 16-27).

2. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marukawa et al. (U.S. Patent 5,627,090) in view of Shinji Matsui (IEEE Vol. 85, No. 4, April 1997) as applied to claims 1-12, 14, 16-29, and 33-36 above, and further in view of Hoechst AG (1999 Derwent Information LTD 1976-32210X).

In re claims 13 and 15, **Hoechst** discloses wherein the organic molecule is a mercaptoalkanoic acid and wherein each layer of organic molecules is connected with Cu^{2+} ions (Basic-Abstract). It would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine the teaching of Marukawa, Matsui, and Hoechst to enable the organic molecule resist of Marukawa to be formed and furthermore the resist is easily removed after etching or degreasing (Basic-Abstract, Hoechst).

Response to Applicant's Arguments and Amendment

Applicant's arguments filed August 31st, 2004 have been fully considered but they are not persuasive.

Applicants contend that contrary to the prior art of record, the inventive organic molecule layer absorbs preferentially on a parent structure as compared to a substrate and successive organic molecule layers are added with intermediate application of a metal ion solution.

In response to Applicants' contention that the prior art is silent as to these claimed limitations, Examiner respectfully disagrees. Applicants are directed to page 3, 1st and 2nd paragraphs presented in this Office Action, where Marukawa in combination with Matsui discloses a method for manufacturing nanostructure patterns comprising: overlaying a parent structure 3 and 4 selectively deposited on a substrate 1 with an organic molecule 5 and 6 having a metal ion coordinating portion adsorbing on the parent structure in preference to the substrate to form an organic molecule layered parent structure (col. 7, line 61 to col. 10, line 4 and FIGS. 1-5) and applying a metal ion solution (Au) to the organic molecule layered parent structure to attach the metal ion to the metal ion coordinating portion of the organic molecule (PMMA) and forming an organic molecule layer attached to the metal ion (pages 630-631). Thus, the prior art teaches Applicants' claimed invention.

For these reasons, examiner holds the rejection proper.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the

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advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (571) 272-1865. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (571) 272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

K.N.
November 14th, 2004



**W. DAVID COLEMAN
PRIMARY EXAMINER**